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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:

OOYAMA

Serial No.: 10/072,143

Filed: February 6, 2002

Atty. File No.: 2933AS-5

For: "MOTOR"

Group Art Unit: 2834

Examiner: Lam, T.

AMENDMENT AND RESPONSE

CERTIFICATE OF MAILING

I HEREBY CERTIFY THAT THIS CORRESPONDENCE IS BEING DEPOSITED WITH THE UNITED STATES POSTAL SERVICE AS FIRST CLASS MAIL IN AN ENVELOPE ADDRESSED TO THE ASSISTANT COMMISSIONER FOR PATENTS, WASHINGTON, D.C. 20231 ON 4/29/03

SHERIDAN ROSS P.C.

BY: Christine Jacquet

Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

Applicant submits this Amendment and Response to address the Office Action having a mailing date of January 29, 2003 (Paper No. 10). Although the Applicant believes that no fees are due for filing this Amendment and Response, please charge any fees deemed necessary to Deposit Account No. 19-1970.

REMARKS/ARGUMENTS

The Examiner has rejected all of the pending claims of the above-identified application pursuant to 35 USC §103(a) as being unpatentable over Mizutani et al. in view of Fushiya. More specifically, the Examiner has asserted that the combination of Mizutani, a U.S. patent publication filed August 24, 2001, and Fushiya, a U.S. patent filed December 22, 1987, render the Claims 1-22 of the present case obvious. Applicant respectfully traverses the Examiner's rejection of claims for the reasons set forth below.

In order to be used as the basis for an obviousness rejection a reference must be prior art. The present application has claimed foreign priority pursuant to 35 USC §119 to two Japanese patents filed February 6, 2001 and December 7, 2001. The Mizutani reference, however, has a filing date, and therefore an effective prior art date, of August 24, 2001, which falls between the priority dates of the present application. An applicant may be able to overcome the prior art that post dates a claimed foreign priority date by proving he or she is entitled to his or her own 35 USC 119 priority date that earlier than the reference's U.S. filing date. In re Hilmer, 359 F.2d 859, 149 USPQ 480 (CCPA 1966). Applicant respectfully submits that the claims of the above-identified application are supported by Japanese Application JP2001-029855, filed February 6, 2001. As such, the Mizutani reference can not be used as a basis for an obviousness rejection. The Examiner also states that certified copies of foreign references have not been received, however a copy of the filing postcard is attached hereto that shows that certified copies of the priority documents were previously submitted. Applicant would be pleased to re-send such documents upon the Examiner's request.

Applicant provides the attached English translation of the earliest priority document, JP2001-029855 (hereinafter the '855 application).

The Examiner initially rejects Claim 1 by stating that the Mizutani reference teaches every element of the claim except for the allocation of electric parts on both sides of a base plate. The '855 application clearly provides the basis for Claim 1, since Figure 8 shows the base plate (22) and part holders (36 and 37) on either side thereof.

The Examiner next rejects Claim 2 stating that the cited references disclose a plurality of electric parts having longitudinal axes that are parallel. The '885 application provides basis for this claim in Figure 5, (please note that L0, L3, L4, L5, and L6 are shown parallel).

Claim 3 derives its basis from Figure 5 of the '885 application. More specifically, the base plate (22) is shown with at least one electrical part (32) on one side with an axis (L3) parallel to that of the rotating shaft (L0) and at least on electrical part (28) on the opposite side with a longitudinal axis parallel to the base plate (22).

Claim 4 finds basis in claim 4 of the '885 application and numerous figures thereof.

Claim 5 finds basis in claim 6 of the '885 application.

The Examiner further contends that Claim 6 is rendered obvious in view of the cited references. Applicant respectfully disagrees. In order to establish a prima facia case for obviousness an examiner must first assert some suggestion or motivation to combine the references to teach the claim at issue. MPEP § 706.02(j). In addition, the relevant teachings of the prior art relied upon, preferably with reference to page numbers, column, and line numbers, should be given. Id. Neither of the references cited by the Examiner describe or otherwise teach a heat receiving portion, especially in combination with the other recited elements of Claim 6. Thus, Applicant respectfully submits that there is no motivation to combine the references to achieve the claimed invention.

Claim 7 is supported by claim 1 of the '885 application.

Claim 8 is supported by claim 3 of the '885 application.

Claim 9 is supported by claim 4 of the '885 application.

Claim 10 is supported by claim 5 of the '885 application.

Claim 11 is supported by claim 6 of the '885 application.

Claim 12 is supported by claim 7 of the '885 application.

Claim 13 is supported by claim 8 of the '885 application.

Claim 14 is supported by claim 9 of the '885 application.

Claim 15 is supported by claim 9 of the '885 application.

Claim 16 is supported by claim 10 of the '885 application.

Claim 17 is supported the '885 specification page 10, line 21, and Fig. 2, which describes and depicts an output shaft orthogonal to the rotating shaft.

Finally, Claims 18 to 22 are supported by claim 2 of the '885 application and dependent claims thereof.

Although specific examples from the '885 application have been cited in order to provide said support, and therefore a priority date for claims in the present case, Applicant asserts that there may be still other support for the claims at issue in the '885 application.

Based upon the foregoing, Applicant believes that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecution and/or expedite allowance, the Examiner is invited to contact the undersigned.

Respectfully submitted,

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26 No. of Pages in Specification

5 No. of Pages in Claims

15 No. of Sheets of Drawings

LIST ALL DOCUMENTS BEING SENT TO PATENT OFFICE:

UTILITY PATENT APPLICATION TRANSMITTAL, PATENT APPLICATION, FORMAL DRAWINGS, DECLARATION, ASSIGNMENT, RECORDATION OF ASSIGNMENT, INFORMATION DISCLOSURE STATEMENT, PTO 1449 FORM, 2 REFERENCES, CERT COPIES OF JAP. PAT. APPL 2001-29855 & 2001-383455

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FACSIMILE COVER SHEET

DATE: April 21, 2003
TO: Mr. Craig W. Mueller
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FAX NO.: 010-1-303-863-0223
YOUR REF.: 2933AS-5
OUR REF.: P1P2001300US
FROM: Kohzoh Hattori
TOTAL NUMBER OF PAGES, INCL. THIS COVER PAGE: 36 **page(s)**
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If this telecopy is illegible or all pages have not been received, please fax at 81-58-266-8069 or call International Department at 81-58-265-9124.

PATENT OFFICE
JAPANESE GOVERNMENT

This is to certify that the annexed is a true copy of the following application as filed with this Office.

Date of Application: February 6, 2001
Application Number: JP2001-029855
Applicant(s): ASMO CO., LTD.

January 11, 2002

Commissioner, Patent Office Kohzoh OIKAWA

Docket Number: 2001-3114984

[Title of Document] Petition For Patent
[Reference Number] PY20002893
[Filing Date] February 6, 2001
[To] The Commissioner of the Patent Office
[International Patent Classification] H02K 11/02
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[Amount of Charge]
[Receipt Number for Advance Payment] 002956
[Amount of Payment] 21,000 Yen
[List of Documents Attached]
[Name of Document] Specification 1
[Name of Document] Drawings 1
[Name of Document] Abstract 1
[Number of General Power of Attorney] 9804529
[Official Confirmation Required/Not Required] Required

[Title of Document] Specification

[Title of the Invention] Motor

[Scope of the Invention]

[Claim 1] A motor having, in a housing, an armature, a brush device, and a plurality of electric parts, wherein the armature has a rotating shaft, the brush device has brush holders integrally formed on a base plate, wherein the brush holders hold brushes that are brought into friction contact with a commutator provided in an armature, wherein the electric parts include choke coils for preventing noise and a circuit breaker for protecting circuit mounted on the base plate, the motor being characterized by a plurality of part holders, wherein the part holders position the electric parts such that the longitudinal axes thereof extend parallel to the axis of the rotating shaft, and hold the electric parts, respectively, wherein the part holders are integrally mounted on the base plate.

[Claim 2] A motor having a motor section, a decelerating section, a brush device, and a plurality of electric parts, wherein the motor section rotatably contains an armature having a rotating shaft in a yoke housing, the decelerating section contains a decelerating mechanism for transmitting decelerated revolution of the rotating shaft to an output shaft in a gear housing that is integrally formed with the yoke housing, the brush device has brush holders integrally formed on a base plate, wherein the brush holders hold brushes that are brought into friction contact with a commutator located in the vicinity of an open end of the yoke housing and provided in the armature, and the electric parts include choke coils for preventing noise and a circuit breaker for protecting circuit mounted on the base plate of the brush device, the motor being characterized by a plurality of part holders, wherein the part holders position the electric parts such that the longitudinal axes thereof extend parallel to the axis of the rotating shaft, and hold the electric parts,

respectively, wherein the part holders are integrally mounted on the base plate.

[Claim 3] The motor according to claim 1 or 2, characterized in that

each part holder is removably attached to the base plate.

[Claim 4] The motor according to any one of claims 1 to 3, characterized in that

the base plate includes fixing portions in alignment with the central line that intersects perpendicularly to the axis of the rotating shaft on the plane of the base plate, and

wherein the part holders are arranged to form symmetry with respect to the central line.

[Claim 5] The motor according to claim 4, characterized in that,

the plurality of part holders comprise a first part holder and a second part holder.

[Claim 6] The motor according to claim 5, characterized in that,

the electric parts comprise three choke coils and a single circuit breaker, and

wherein the first part holder holds two of the three choke coils, whereas the second part holder holds one of the three choke coils and the single circuit breaker.

[Claim 7] The motor according to any one of claims 1 to 6, characterized in that,

the part holders are located on the different planes of the base plate.

[Claim 8] The motor according to any one of claims 1 to 7, characterized in that,

each part holder has a holding piece for holding a joint of the electric part held in the part holder and a member that is electrically connected to the electric part.

[Claim 9] A motor having a motor section, a decelerating section, a brush device, and a plurality of electric parts, wherein the motor section rotatably contains an armature

having a rotating shaft in a yoke housing, the decelerating section contains a decelerating mechanism for transmitting decelerated revolution of the rotating shaft to an output shaft in a gear housing that is integrally formed with the yoke housing, the brush device has brush holders integrally formed on a base plate, wherein the brush holders hold brushes that are brought into friction contact with a commutator located in the vicinity of an open end of the yoke housing and provided in the armature, and the electric parts include choke coils for preventing noise and a circuit breaker for protecting circuit mounted on the base plate of the brush device, the motor being characterized in that the gear housing has a bracket mounting portion and a receiving portion, wherein the bracket mounting portion is attached to a mounting bracket for mounting the motor, and the receiving portion receives the electric parts, wherein the electric parts and the receiving portion for receiving the electric parts are located at a position towards the brake mounting portion in relation to the center axis of the rotating shaft.

[Claim 10] The motor according to claim 9, characterized in that,

the receiving portion is located at a position wherein the receiving portion does not protrude beyond the profile of the yoke housing.

[Claim 11] The motor according to claim 9 or 10, characterized in that,

the receiving portion is located at a position towards the yoke housing in relation to the output shaft along the axis of the rotating shaft.

[Detailed Description of the Invention]

[0001]

[Industrial Field of Application]

The present invention relates to a motor having, in its housing, electric parts including choke coils for preventing noise (electromagnetic noise) and a circuit breaker serving as

a circuit protector.

[0002]

[Prior Art]

There are some conventional direct current motors having electric parts including choke coils for preventing noise (electromagnetic noise) and circuit breakers serving as circuit protectors in their housings, respectively.

[003]

[Problems that the Invention is to Solve]

When such motors are used, for example, in vehicles, they are inevitably demanded to come in small sizes, since vehicles have small spaces for them. Therefore, it is demanded to arrange the electric parts including choke coils and a circuit breaker efficiently in the motor housing so as to achieve downsizing of such a motor or an apparatus employing the motor as a drive source.

[0004]

The present invention was accomplished in order to solve the problem described above, and it is an object of the invention to provide a downsizable motor.

[0005]

To solve the above object, the invention according to claim 1 provides a motor having an armature, a brush device and a plurality of electric parts in a housing. The armature has a rotating shaft. The brush device has brush holders integrally formed on a base plate. The brush holders hold brushes that are brought into friction contact with a commutator provided in an armature. The electric parts include choke coils for preventing noise and a circuit breaker for protecting circuit and are mounted on the base plate. The motor further includes a plurality of part holders for positioning the electric parts such that the longitudinal axes thereof extend parallel to the axis of the rotating shaft and holding the electric parts, respectively. The part holders are integrally mounted on the base plate.

[0006]

The invention according to claim 2 provides a motor having a motor section, a decelerating section, a brush device and a plurality of electric parts. The motor section rotatably contains an armature having a rotating shaft in a yoke housing. The decelerating section contains a decelerating mechanism for transmitting decelerated revolution of the rotating shaft to an output shaft in a gear housing that is integrally formed with the yoke housing. The brush device has brush holders integrally formed on a base plate. The brush holders hold brushes that are brought into friction contact with a commutator located in the vicinity of an open end of the yoke housing and provided in the armature. The electric parts include choke coils for preventing noise and a circuit breaker for protecting circuit and are mounted on the base plate of the brush device. The motor further includes a plurality of part holders for positioning the electric parts such that the longitudinal axes thereof extend parallel to the axis of the rotating shaft and holding the electric parts, respectively. The part holders are integrally mounted on the base plate.

[0007]

The invention according to claim 3 provides the motor as set forth in claim 1 or 2, wherein each part holder is removably attached to the base plate.

The invention according to claim 4 provides the motor as set forth in any one of claims 1 to 3, wherein the base plate includes fixing portions in alignment with the central line that intersects perpendicularly to the axis of the rotating shaft on the plane of the base plate, and wherein the part holders are arranged to form symmetry with respect to the central line.

[0008]

The invention according to claim 5 provides the motor as set forth in claim 4, wherein the plurality of part holders

comprise a first part holder and a second part holder.

The invention according to claim 6 provides the motor as set forth in claim 5, wherein the electric parts comprise three choke coils and a single circuit breaker, and wherein the first part holder holds two of the three choke coils, whereas the second part holder holds one of the three choke coils and the single circuit breaker.

[0009]

The invention according to claim 7 provides the motor as set forth in any one of claims 1 to 6, wherein the part holders are located on the different planes of the base plate.

The invention according to claim 8 provides the motor as set forth in any one of claims 1 to 7, wherein each part holder has a holding piece for holding a joint of the electric part held in the part holder and a member that is electrically connected to the electric part.

[0010]

The invention according to claim 9 provides a motor having a motor section, a decelerating section, a brush device and a plurality of electric parts. The motor section rotatably contains an armature having a rotating shaft in a yoke housing. The decelerating section contains a decelerating mechanism for transmitting decelerated revolution of the rotating shaft to an output shaft in a gear housing that is integrally formed with the yoke housing. The brush device has brush holders integrally formed on a base plate. The brush holders hold brushes that are brought into friction contact with a commutator located in the vicinity of an open end of the yoke housing and provided in the armature. The electric parts include choke coils for preventing noise and a circuit breaker for protecting circuit and are mounted on the base plate of the brush device. That the gear housing has a bracket mounting portion attached to a mounting bracket for mounting the motor and a receiving portion for receiving the electric parts. The electric parts and the receiving portion

for receiving the electric parts are located at a position towards the brake mounting portion relative to the center axis of the rotating shaft.

[0011]

The invention according to claim 10 provides the motor as set forth in claim 9, wherein the receiving portion is located within the profile of the yoke housing.

The invention according to claim 11 provides the motor as set forth in claim 9 or 10, wherein the receiving portion is located at a position towards the yoke housing in relation to the output shaft along the axis of the rotating shaft.

[0012]

(Operation)

In the invention according to claims 1 and 2, the plurality of part holders that are integrally mounted on the base plate of the brush device position the electric parts including choke coils for preventing noise and a circuit breaker for protecting circuit such that the longitudinal axes thereof extend substantially parallel to the axis of the rotating shaft and hold the electric parts, respectively. Therefore, even in the case where these electric parts are arranged in close vicinities, the part holders insulate the electric parts. Further, these electric parts are positioned such that the longitudinal axes thereof extend parallel to the axis of the rotating shaft. Thus, the motor does not protrude outward in the radial direction thereof. Further, since the plurality of part holders is separately positioned, interference between the part holders and other motor constituents can easily be avoided compared with the case where only one part holder is used. This enables downsizing of the motor.

[0013]

In the invention according to claim 3, each part holder is removably attached to the base plate. Thus, each part holder and electric parts can be attached and detached easily.

[0014]

In the invention according to claim 4, the base plate includes fixing portions in alignment with the central line that intersects perpendicularly to the axis of the rotating shaft on the plane of the base plate and the part holders are arranged to form symmetry with respect to the central line. Therefore, weight balance on the plane of the base plate around the fixing portions can be improved. This leads the motor to have a vibration-resistant structure.

[0015]

In the invention according to claim 5, the plurality of part holders comprise a first part holder and a second part holder. Therefore, weight balance on the plane of the base plate around the fixing portions is improved.

In the invention according to claim 6, the first part holder holds two of the three choke coils, whereas the second part holder holds one of the three choke coils and the single circuit breaker. The weight of the two choke coils is substantially the same as that of the one choke coil and the one circuit breaker. Therefore, weight balance on the plane of the base plate around the fixing portions is securely improved.

[0016]

In the invention according to claim 7, the part holders are arranged on the different planes of the base plate. This constitution can easily avoid interference between the part holders and other motor constituents even in the case where downsizing of the motor is achieved compared with the case where the part holders are arranged on a single plane. This leads downsizing of the motor. Further, weight balance in the axial direction of the rotating shaft is improved.

[0017]

In the invention according to claim 8, the holding piece integrally mounted on each part holder holds a joint of the electric part held in the holder and a member that is

electrically connected to the electric part. Therefore, insulation of the joints is achived. Further, useless dislocation of the joints is prevented, thus avoiding disconnection in the joints.

[0018]

In the invention according to claim 9, the electric parts and the receiving portion that receives the electric parts in the gear housing are located at position towards the bracket mounting portion in relation to the rotating shaft and the bracket mounting portion. Therefore, the receiving portion for receiving the electric parts protrudes outward the gear housing. However, the receiving portion is a dead space for in-vehicle elements other than the motor and the mounting bracket on which the bracket mounting portion is mounted. Disposing the electric parts and the receiving portion for receiving the electric parts in such a space achieves downsizing of other parts of the motor, leading to overall downsizing of the apparatus that employs the motor as a drive source.

[0019]

In the invention according to claim 10, the receiving portion is located within the profile of the yoke housing. Therefore, downsizing of the motor in the radial direction thereof is achieved.

[0020]

In the invention according to claim 11, the receiving portion is located towards the yoke housing in relation to the output shaft along the axis of the rotating shaft. Therefore, downsizing of the space toward the distal end portion from the output shaft, or the space opposing the yoke housing across the output shaft, is achieved.

[0021]

[Embodiment]

The present invention will be described below by way of an embodiment referring to the drawings.

Figs. 1 and 2 show a wiper motor 1. The wiper motor 1 is used as a drive source of an in-vehicle wiper apparatus for wiping the windshield of a vehicle clouded with raindrops and the like. The wiper motor 1 is composed essentially of a motor section 2 and a decelerating section 3 for decelerating revolution in the motor section 2.

[0022]

In the motor section 2, a yoke housing 4 is formed with a conductive metallic material to have a cylindrical shape with a closed bottom. The yoke housing 4 has a plurality of magnet pieces 5 fixed onto the inner circumferential surface thereof, and an armature 6 is rotatably supported inside the magnet pieces 5. The yoke housing 4 has in the bottom a bearing 8 for rotatably supporting the proximal end portion of a rotating shaft 7 of the armature 6. A gear housing 11 of the decelerating section 3 is fixed with screws 12 to the open end 4a of the yoke housing 4, as shown in Fig. 3, such that the gear housing 11 covers the rotating shaft 7 protruding from the yoke housing 4.

[0023]

As shown in Fig. 2, in the decelerating section 3, the gear housing 11 is made of a metallic material such as an aluminum alloy and has an open end 11a having substantially the same profile as that of the open end 4a of the yoke housing 4. The gear housing 11 is formed such that it accommodates the distal end portion of the rotating shaft 7 and a worm wheel 13 and so forth. The gear housing 11 contains a bearing 14 fixed thereto and a bearing portion 11b formed therein. The bearing 14 and the bearing portion 11b rotatably support the middle portion and the distal end portion of the rotating shaft 7, respectively. The rotating shaft 7 has a worm 7a formed thereon between the bearing 14 and the bearing portion 11b. The worm 7a is meshed with the worm wheel 13. An output shaft 15 is connected to the worm wheel 13 to be rotatable integrally therewith. The output

shaft 15 is oriented perpendicular to the rotating shaft 7. The output shaft 15 is rotated by the rotation of the rotating shaft 7. Here, the gear housing 11 is attached to a bracket B of a wiper apparatus (not shown) through a bracket mounting portion 11c provided on the output shaft side. The output shaft 15 is operationally connected to a wiper arm through a link mechanism of the wiper apparatus (not shown). The wiper arm carries out a predetermined wiping action under rotation of the output shaft 15.

[0024]

A brush device 21, which is a constituent of the motor section 2, is fixed to the open end 11a of the gear housing 11. As shown in Figs. 4 and 5, the brush device 21 is provided with a substantially annular insulating base plate 22. The insulating base plate 22 has an insertion hole 22a defined at the center, to which the rotating shaft 7 is to be inserted. The insulating base plate 22 has a pair of notches 22b formed by cutting the peripheral edge thereof, which is shown in Fig. 5, so that they locate on each side of the insertion hole 22a in alignment with the vertical central line L1 passing the center of the insertion hole 22a (axis L0 of the rotating shaft 7), as shown in Fig. 3. A rubber cushion 23 is fitted in each notch 22b. A screw inserting hole 23a is defined at the center of each rubber cushion 23, and a screw 24 is inserted to the screw inserting hole 23a, as shown in Fig. 3. The screws 24 are driven into the gear housing 11 to fix the insulating base plate 22, or the brush device 21, to the gear housing 11 through the rubber cushions 23. Thus, vibrations to be generated when brushes 28 to 30 are brought into friction contact with the surface of a commutator 6a are adapted to be damped by the rubber cushions 23.

[0025]

Meanwhile, as shown in Figs. 3 to 5, a common brush holder 25 is fixed to the insulating base plate 22 on a first plane 22x opposing the yoke housing 4 and between the vertical

central line L1 and the horizontal central line L2 (on the lower right section in Fig. 3). The horizontal central line L2 intersects orthogonally to the vertical central line L1 and passes the center of the insertion hole 22a. A low-speed brush holder 26 is fixed to the first plane 22x to oppose the common brush holder 25 across the insertion hole (on the upper left section in Fig. 3). Further, a high-speed brush holder 27 is fixed to the first plane 22x at such a position that the brush holders 27 and 26 may form a substantially symmetric arrangement with respect to the horizontal central line L2 (on the lower left section in Fig. 3). The high-speed brush holder 27 is disposed at a predetermined angular interval with respect to the low-speed brush holder 26. The common, low-speed and high-speed brush holders 25 to 27 hold the common, low-speed and high-speed brushes 28 to 30, respectively. Torsion coiled springs 31 are provided in the vicinities of the brush holders 25 to 27, respectively, as shown in Fig. 3. The torsion coiled springs 31 are provided so as to urge the brushes 28 to 30 toward the commutator 6a fixed to the rotating shaft 7.

[0026]

A plurality of choke coils 32 to 34 for preventing noise (electromagnetic noise), and a circuit breaker 35 as a circuit protector are integrated into the brush device 21. The choke coils 32 and 33 each have a substantially cylindrical shape, and cores 32a and 33a are fixed at the centers thereof, respectively. The choke coils 32 and 33 are provided for the low-speed brush 29 and high-speed brush 30, respectively, and are incorporated into a resinous first part holder 36 shown in Fig. 6. Meanwhile, the choke coil 34 also has a substantially cylindrical shape, and a core 34a is fixed at the center thereof. The choke coil 34 is provided for the common brush 28 and is incorporated to a resinous second part holder 37 shown in Fig. 7 together with the substantially square circuit breaker 35. The first and second part holders 36 and 37 are

integrated into one unit to improve assembling properties to the insulating base plate 22.

[0027]

The first part holder 36 is located on the left side of the vertical central line L1 of the insulating base plate 22 and between the low-speed brush holder 26 and the high-speed brush holder 27 in alignment with the horizontal central line L2, as shown in Figs. 3 to 5. More specifically, a notch 22c is formed on the left side of the horizontal central line L2 of the base plate 22 to extend from the peripheral edge thereof radially inward, as shown in Fig. 5. Meanwhile, the first part holder 36 has on the outer circumferential surface a fitting groove 36a to be fitted to the notch 22c, as shown in Figs. 5 and 6. Thus, the first part holder 36 is removably mounted onto the insulating base plate 22 by fitting the fitting groove 36a to the notch 22c.

[0028]

Further, the first part holder 36 is provided with a pair of substantially cylindrical coil holding portions 36b and a pair of terminal receiving portions 36c. The coil holding portions 36b extend from the distal end thereof along the axis L0 of the rotating shaft 7 on the plane 22x opposing the yoke housing 4, and the first and second choke coils 32 and 33 are inserted to the associated coil holding portions 36b, respectively. The pair of coil holding portions 36b are juxtaposed to each other as independent parts along the vertical central line L1 being intervened by the horizontal central line L2. The terminal receiving portions 36c communicate with the coil holding portions 36b respectively and extend along the axis L0 to a plane 22y opposing the gear housing 11. That is, the plane 22y opposes the plane 22x.

[0029]

The choke coils 32 and 33 are connected each at one end to the low-speed brush 29 and to the high-speed brush 30 through pigtails 38 and 39, respectively, and female

connecting terminals 40 and 41 are fixed integrally to the other ends of the choke coils 32 and 33, respectively, by means of fusing. It should be noted here that, when the brush device 21 is incorporated into the gear housing 11, the connecting terminals 40 and 41 are connected respectively to male connecting terminals provided in the housing 11. The male connecting terminals are electrically connected to terminals (not shown) in a connecting portion 11d provided on the housing 11 shown in Figs. 1 and 2 so as to receive power supply through connectors (not shown) in the vehicle.

[0030]

The choke coils 32 and 33 are inserted from the terminals 40 and 41 thereof into the respective coil holding portions 36b, as shown in Fig. 6. Thus, the terminals 40, 41 and the choke coils 32, 33 are held in the terminal receiving portions 36c and in the coil holding portions 36b, respectively. The choke coils 32 and 33 are located in the yoke housing 4 such that the axes L3 and L4 thereof are parallel to the axis L0 of the rotating shaft 7.

[0031]

Further, the choke coils 32 and 33 are held by independent coil holding portions 36b respectively such that the coils 32 and 33 do not substantially expose themselves, thus preventing short-circuiting with other parts. Each coil holding portion 36b has, near the opening thereof, a holding piece 36d for holding joint 42(43) of a tail end of the choke coil 32(33) and the pigtail 38(39), as shown in Fig. 6. The holding pieces 36d hold the joints 42 and 43 respectively to achieve insulation from other parts and also prevent unnecessary dislocation of the joints 42 and 43, thus avoiding disconnection at the joints 42 and 43.

[0032]

Meanwhile, the second part holder 37 is located on the right side of the vertical central line L1 of the insulating base plate 22 on the second plane 22y opposing the gear

housing 11 and in alignment with the horizontal central line L2, as shown in Figs. 3 to 5. In other words, the second part holder 37 is located to oppose the first part holder 36 across the insertion hole 22a. More specifically, a notch 22d is formed to extend inward from the peripheral edge of the base plate 22 on the right side of the vertical central line L1 of the base plate 22 and in alignment with the horizontal central line L2 thereof, as shown in Fig. 5. The notch 22d has in the vicinity thereof another notch 22e forming a pair therewith. Meanwhile, the second part holder 37 has a main engaging piece 37a at the center of the proximal end portion thereof and auxiliary engaging pieces 37b and 37c at both end portions, respectively, as shown in Figs. 5 and 7. Thus, the second part holder 37 can be removably mounted onto the insulating base plate 22 by engaging the main engaging piece 37a and one auxiliary engaging piece 37b with the notch 22d and by engaging the other auxiliary engaging piece 37c with the notch 22e.

[0033]

Further, as shown in Figs. 4, 5 and 7, the second part holder 37 is provided with a cylindrical coil holding portion 37d (to which the choke coil 34 is to be inserted) extended from the proximal end thereof along the axis L0 of the rotating shaft 7, and a breaker holding portion 37e. The breaker holding portion 36e is located parallel to the coil holding portion 37d such that they are intervened by the horizontal central line L2. That is, the coil holding portion 37d is located above the horizontal central line L2, whereas the breaker holding portion 37e is located below the horizontal central line L2.

[0034]

One end of the choke coil 34 is connected to an earth terminal 45 through a connecting line 44, and the other end is bent outward along the radius of the coil 34. The earth terminal 45 is grounded by interposing it between one screw 24

for fixing the insulating base plate 22 (brush device 21) and the rubber cushion 23, as shown in Fig. 3.

[0035]

The choke coil 34 is inserted to the coil holding portion 37d and is held thereby, as shown in Fig. 7, before the second part holder 37 is mounted onto the insulating base plate 22. The choke coil 34 is located within the gear housing 11 such that the axis L5 of the coil 34 is parallel to the axis L0 of the rotating shaft 7, as shown in Fig. 4. Here, the opening of the coil holding portion 37d is substantially closed by the insulating base plate 22, when the second part holder 37 is attached to the base plate 22. This prevents the choke coil 34 from slipping out from the holding portion 37d. Incidentally, the other end of the choke coil 34 is led to the outside of the holding portion 37d through an insertion slit 37f formed in the holding portion 37d along the axis thereof and is connected to the circuit breaker 35.

[0036]

Further, the choke coil 34 is held by the coil holding portion 37d such that it does not substantially expose itself, thus preventing short-circuiting with other parts. The coil holding portion 37d has, near the opening thereof, a holding piece 37g for holding a joint 46 of the one end of the choke coil 34 and the connecting line 44. The joint 46 held by the holding piece 37g achieves insulation from other parts and also prevents unnecessary dislocation of the joint 46 to avoid disconnection at the joint 46.

[0037]

Meanwhile, the breaker holding portion 37e has on the outer lateral side thereof a fitting face 37h extended parallel to the axis L0 of the rotating shaft 7 and the vertical central line L1, as shown in Figs. 4, 5 and 7. The fitting face 37h has five engaging pieces 37i formed thereon, which are arranged along the profile of the circuit breaker 35.

[0038]

It should be noted here that one terminal of the circuit breaker 35 is extended toward the insulating base plate 22 and is connected to the common brush 28 through a pigtail 47 and that the other terminal of the circuit breaker 35 has a terminal plate 48 extended to the opposite side of the insulating base plate 22. The terminal plate 48 has a connecting piece 48a, which is connected to the other end of the choke coil 34 led out from the coil holding portion 37d.

[0039]

The thus constituted circuit breaker 35 is engaged with the engaging pieces 37i and is removably attached to the fitting face 37h, as shown in Fig. 7. The circuit breaker 35 is located within the gear housing 11 such that the longitudinal axis L6 of the planar portion 35a is parallel to the axis L0 of the rotating shaft 7, as shown in Fig. 4.

[0040]

The gear housing 11 has on a portion towards the open end 11a (the yoke housing 4) a receiving portion 11a for receiving the coil holding portion 37d, as shown in Figs. 1 and 2. This receiving portion 11e is formed between the output shaft 15 and the yoke housing 4 and not to have a diameter greater than the outside diameter of the yoke housing 4. Further, the receiving portion 11e is located across the rotating shaft 7 from the worm wheel 13, as shown in Fig. 2, and between the axis L0 of the rotating shaft 7 and the mounting bracket B, as shown in Fig. 1. Although formation of such a receiving portion 11e bulges the gear housing 11, the periphery of the receiving portion 11e is a dead space for in-vehicle elements other than the wiper apparatus having the wiper motor 1 and the mounting bracket B. The motor 1 in this embodiment makes efficient use of the dead space.

[0041]

Next, an electric circuit of the in-vehicle wiper apparatus including the choke coils 32 to 34 and the circuit

breaker 35 will be described referring to Fig. 8. As shown in Fig. 8, one end of the choke coil 32 is connected to the low-speed brush 29. The other end of the choke coil 32 is connected to a battery BT through a wiper switch 51, or it is connected to the battery BT through the wiper switch 51 and a cam switch 52 or is grounded. One end of the choke coil 33 is connected to the high-speed brush 30, and the other end thereof is connected to the battery BT through the wiper switch 51, or it is connected to the battery BT through the wiper switch 51 and the cam switch 52 or is grounded. One end of the choke coil 34 is grounded, and the other end thereof is connected to the common brush 28 through the circuit breaker 35. Capacitors 53 and 54 are connected to the other ends (battery BT side) of the choke coils 32 and 33 respectively and to the one end (ground side) of the choke coil 34. The capacitors 53 and 54, which are not illustrated, are located at predetermined positions in the gear housing 11. The choke coils 32 to 34 and the capacitors 53 and 54 prevent generation of noise, or electromagnetic noise, between the brushes 28 to 30 and the commutator 6a, whereas the circuit breaker 35 protects the circuit for supplying power to the motor 1 so that the motor 1 may not be burnt by overcurrent.

[0042]

Characteristics of the above embodiment will be described below.

(1) The choke coils 32 to 34 and the circuit breaker 35 are positioned by the part holders 36 and 37 and are prevented from interfering with one another, as well as, with other motor constituents. Thus, even if these electric parts (choke coils 32 to 34 and the circuit breaker 35) are arranged in close vicinities, they insulated from one another, leading to downsizing of the motor 1.

[0043]

(2) In this embodiment, the part holder is divided into two (a plurality of) part holders, i.e., the first part holder

36 and the second part holder 37. This constitution easily avoids interference among motor constituents compared with the case where only one part holder is used and contributes to downsizing of the motor 1.

[0044]

(3) The choke coils 32, 33 and 34, which are held by the part holders 36 and 37, are arranged such that their axes L3, L4 and L5 are parallel to the axis L0 of the rotating shaft 7, whereas the circuit breaker 35, which is held by the second part holder 37, is oriented such that the longitudinal axis L6 of the planar portion 35a thereof is parallel to the axis L0 of the rotating shaft 7. Therefore, bulging of the motor 1 in the radial direction outward thereof is minimized to achieve downsizing of the motor 1.

[0045]

(4) In this embodiment, each holding portion 36b of the first part holder 36 is entirely disposed on the side of the insulating base plate 22 opposing the yoke housing 4, whereas the holding portions 37d and 37e of the second part holder 37 are entirely disposed on the side of the base plate 22 opposing the gear housing 11. In this embodiment, therefore, interference between these holding portions and other members can be easily prevented even in the case where downsizing of the motor 1 is achieved compared with the case where these holding portions are disposed only on one side of the base plate, leading to downsizing of the motor 1. In addition, the weight balance of the rotating shaft 7 on the insulating base plate 22 in the direction of the axis L0 can be improved.

[0046]

(5) In the brush device 21 of this embodiment, the electric parts are integrated into units by the part holders 36 and 37. This facilitates installation of the choke coils 32 to 34 and the circuit breaker 35 to the insulating base plate 22. Besides, since the part holders 36 and 37 are removably attached to the insulating base plate 22, the part

holders 36 and 37 are attached and detached easily to and from the base plate 22.

[0047]

(6) In the brush device 21 of this embodiment, the first part holder 36, on which the choke coils 32 and 33 are mounted, and the second part holder 37, on which the choke coil 34 and circuit breaker 35 are mounted, are arranged on the insulating base plate 22 to form substantially symmetry with respect to the vertical central line L1 thereof. Arranging these heavy elements symmetrically on the base plate 22 improves weight balance on the plane of the base plate 22 with respect to the central line L1. Since fixing portions to which screws 24 are driven are arranged in alignment with the central line L1, the brush device 21 is allowed to have a vibration-resistant structure.

[0048]

(7) The part holders 36 and 37 have holding pieces 36d and 37g integrally formed therein respectively for holding the joints 42 and 43 connecting the coils 32 and 33 and the pigtails 38 and 39, respectively, and for holding the joint 46 connecting the coil 34 and the connecting line 44. Therefore, the joints 42, 43 and 46 are insulated from other parts and also prevent useless dislocation of the joints 42, 43, and 46. Thus these joints 42, 43 and 46 are prevented from being disconnected.

[0049]

(8) The gear housing 11 has the receiving portion 11e for receiving the coil holding portion 37d, to be located across the rotating shaft 7 from the worm wheel 13 and between the axis L0 of the rotating shaft 7 and the mounting bracket B, or the bracket mounting portion 11c, on the side opposing the opening portion 11a, or the yoke housing (4) side. Thus, formation of such a receiving portion 11e bulges the gear housing 11. However, the periphery of the receiving portion 11e is a dead space for in-vehicle elements other than the

wiper apparatus having the wiper motor 1 and the mounting bracket B. Disposing the receiving portion 11e in such a space achieves downsizing of other parts of the motor 1, leading to overall downsizing of the wiper apparatus. Further, this receiving portion 11e is formed to have a diameter smaller than the outside diameter of the yoke housing 4, contributing to downsizing of the motor 1 in the radial direction. Further, the receiving portion 11e is located in the space between the output shaft 15 and the yoke housing 4 along the axis of the rotating shaft 7, leading to downsizing of the space toward the distal end portion from the output shaft 15, or the space opposing the yoke housing 4 across the output shaft 15, in the axial direction of the rotating shaft 7.

[0050]

The embodiment of the present invention may be modified as described below.

The capacitors 53 and 54 disposed at predetermined positions in the gear housing 11 in the above embodiment may be held by the part holders 36 and 37 like the choke coils 32, 33 and 34 and circuit breaker 35.

[0051]

The constitution of the brush device 21 and those of the part holders 36 and 37 in the above embodiment may be suitably modified. For example, the insulating base plate 22 and the brush holders 25 to 27 may be formed integrally.

[0052]

The motor section 2 and the decelerating section 3 in the above embodiment may be suitably modified.

The present invention is adapted to the wiper motor 1 of the in-vehicle wiper apparatus. However, the present invention may be adapted to a motor of other in-vehicle apparatuses. Further, the present invention may be adapted to a motor of an apparatus other than the in-vehicle apparatus.

[0053]

[Effects of the Invention]

As described above, the present invention provides a downsizable motor.

[Brief Description of the Drawings]

[Fig. 1] A plan view of a wiper motor according to an embodiment.

[Fig. 2] A front view of the wiper motor.

[Fig. 3] A cross-sectional view taken along Line A-A in Fig. 1.

[Fig. 4] A perspective view of a brush device.

[Fig. 5] An exploded perspective view of the brush device.

[Fig. 6] An exploded perspective view of a first part holder.

[Fig. 7] An exploded perspective view of a second part holder.

[Fig. 8] An electric circuit diagram of a wiper apparatus.

[Description of the Reference Numerals]

2…motor section, 4…yoke housing, 4a…open end, 6… armature, 6a…commutator, 7…rotating shaft, 7a…worm constituting decelerating mechanism, 11…gear housing, 11c… bracket mounting portion, 11e…receiving portion, 13…worm wheel constituting decelerating mechanism, 15…output shaft, 21…brush device, 22…insulating base plate as base plate, 22x, 22y…plane, 25, 26, 27…common brush holder, low-speed brush holder and high-speed brush holder as brush holder, 28, 29, 30…common brush, low-speed brush and high-speed brush as brush, 35…circuit breaker as electric part, 36…first part holder, 36d…holding piece, 37…second part holder, 37g… holding piece, 42, 43, 46…joint, B…mounting bracket, L0… axis, L1…central line, L3 to L5…axis as longitudinal axis, L6…longitudinal axis.

[Title of the Document] Abstract

[Abstract]

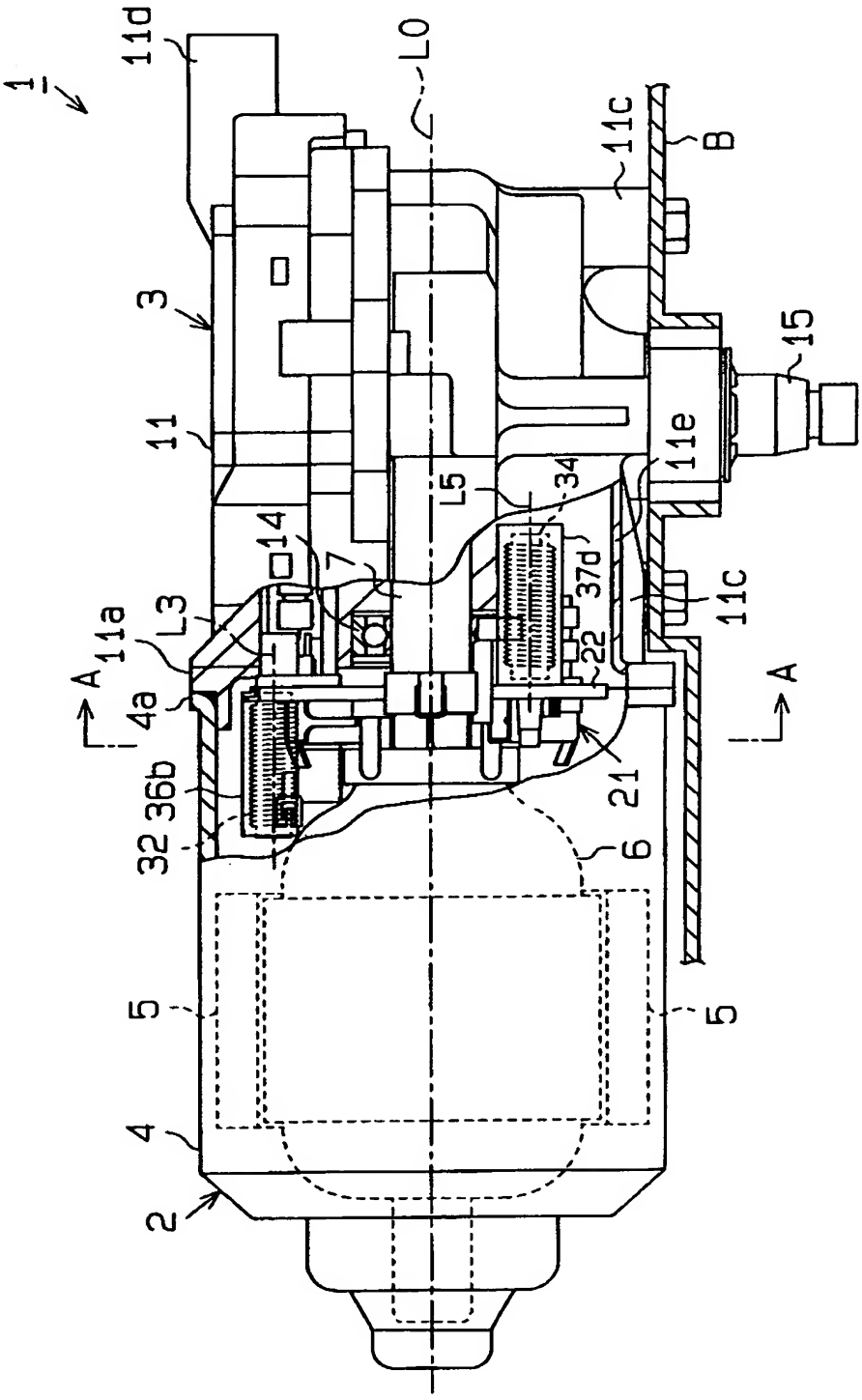
[Objective] To provide a downsizable motor.

[Means for Solving the Problems] First and second part holders 36, 37, which are integrally mounted on a base plate 22 of a brush device 21, locate electric parts such as choke coils 32 to 34 for preventing noise and a circuit breaker 35 for protecting circuit such that the axes L3 to L6 of those electric parts are substantially parallel to the axis L0 of a rotating shaft 7. Those electric parts are allocated to the first and second part holders 36 and 37.

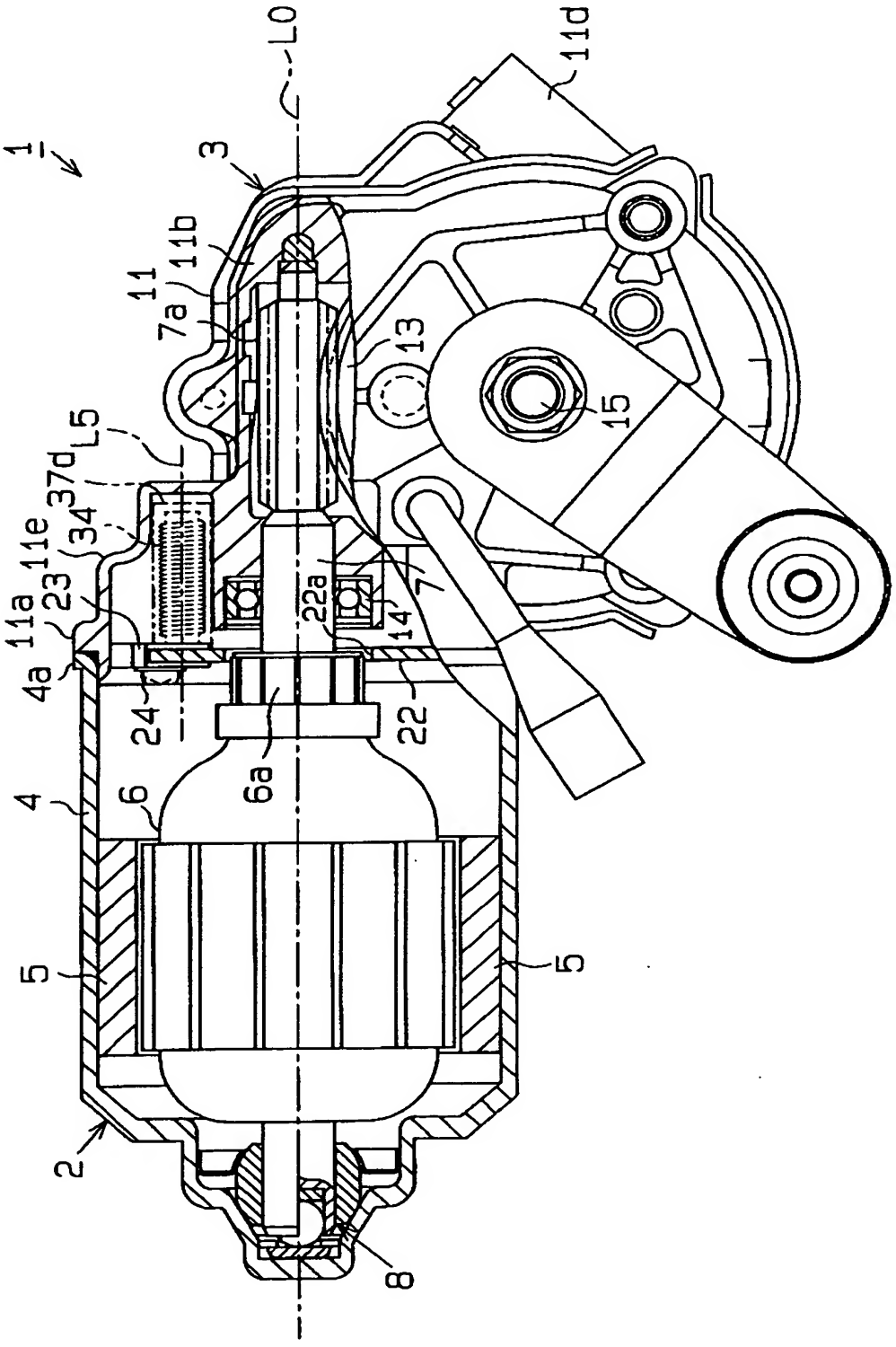
[Selected Drawing] Fig. 4

[Title of Document] Drawings

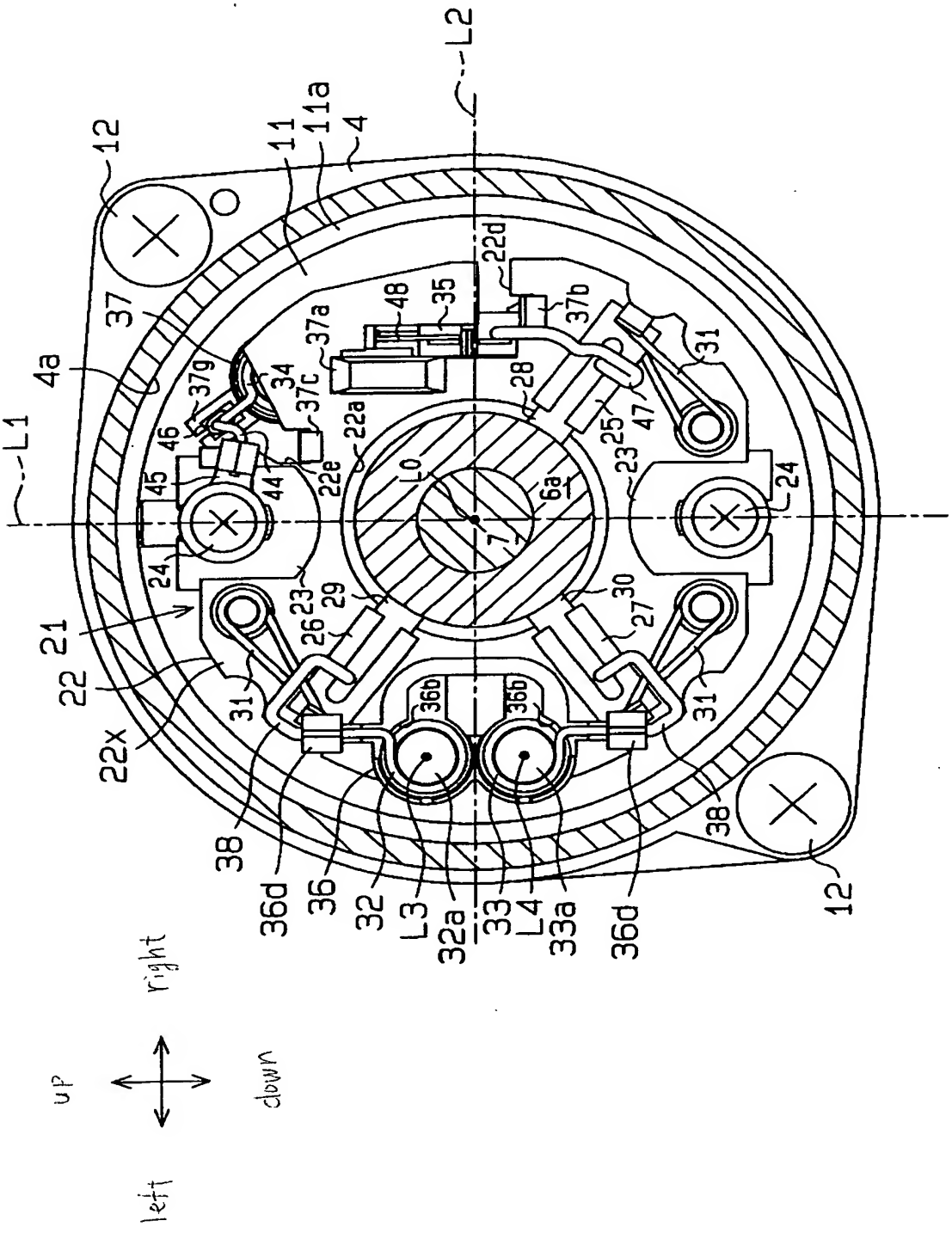
[Fig. 1]



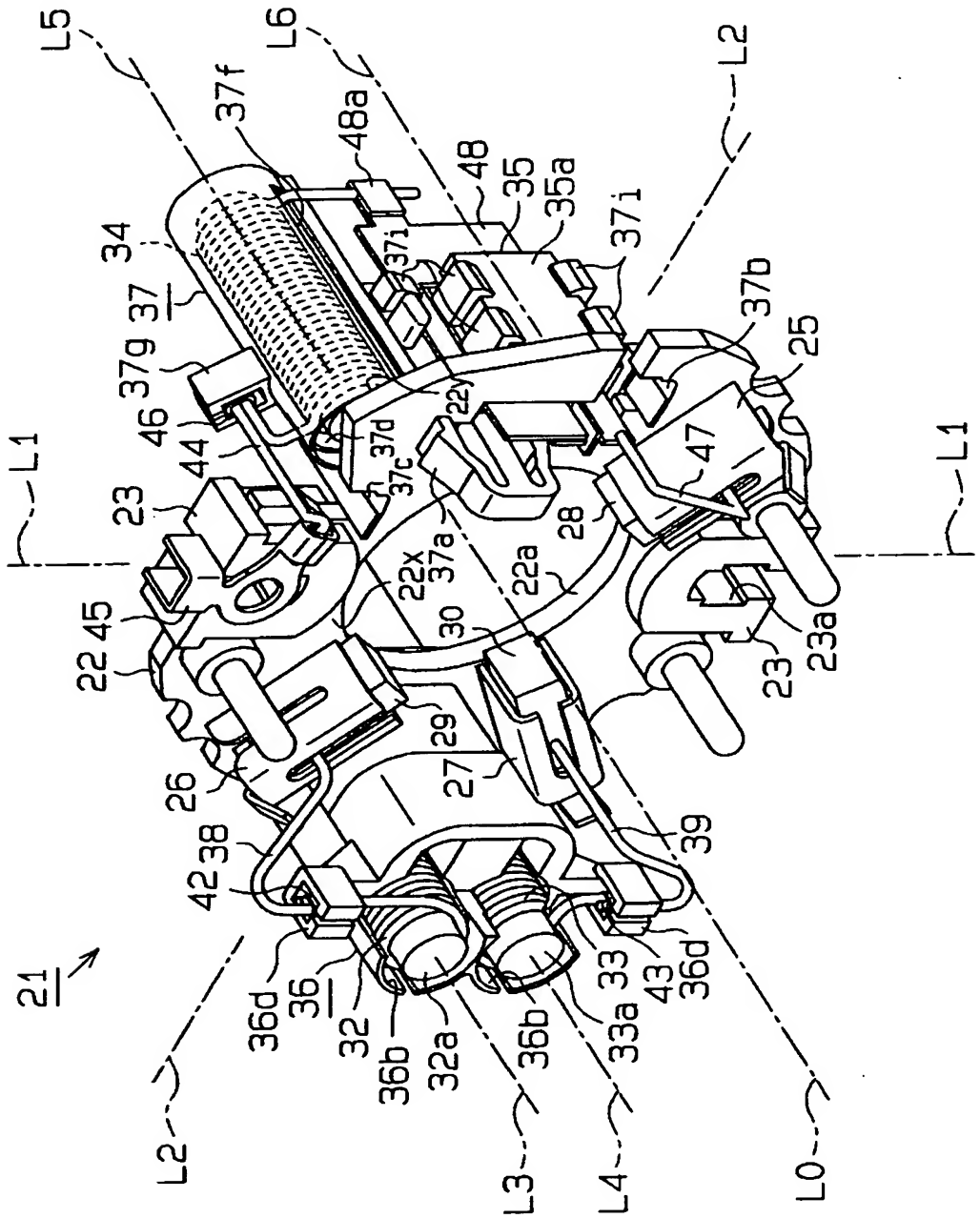
[Fig. 2]



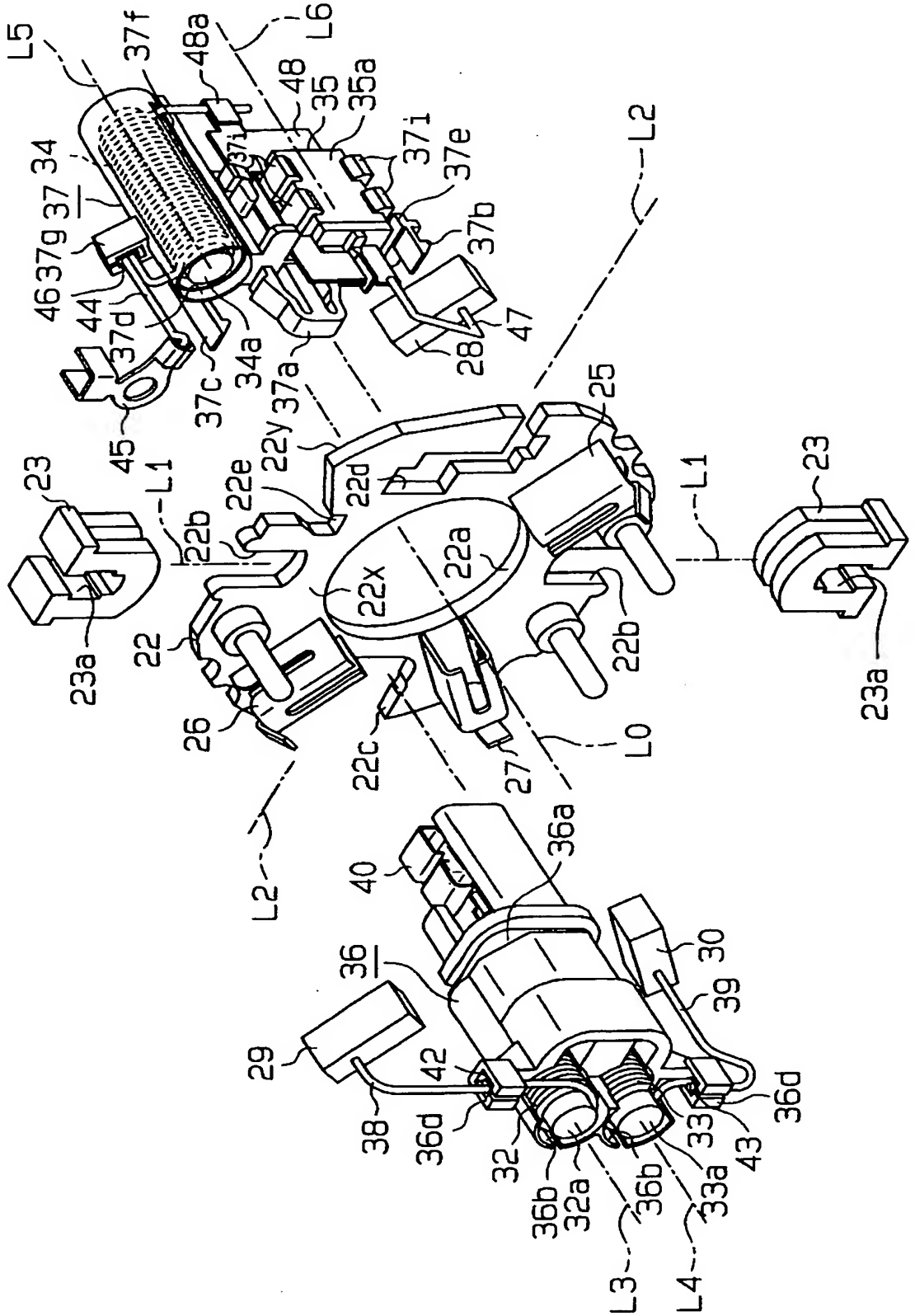
[Fig. 3]



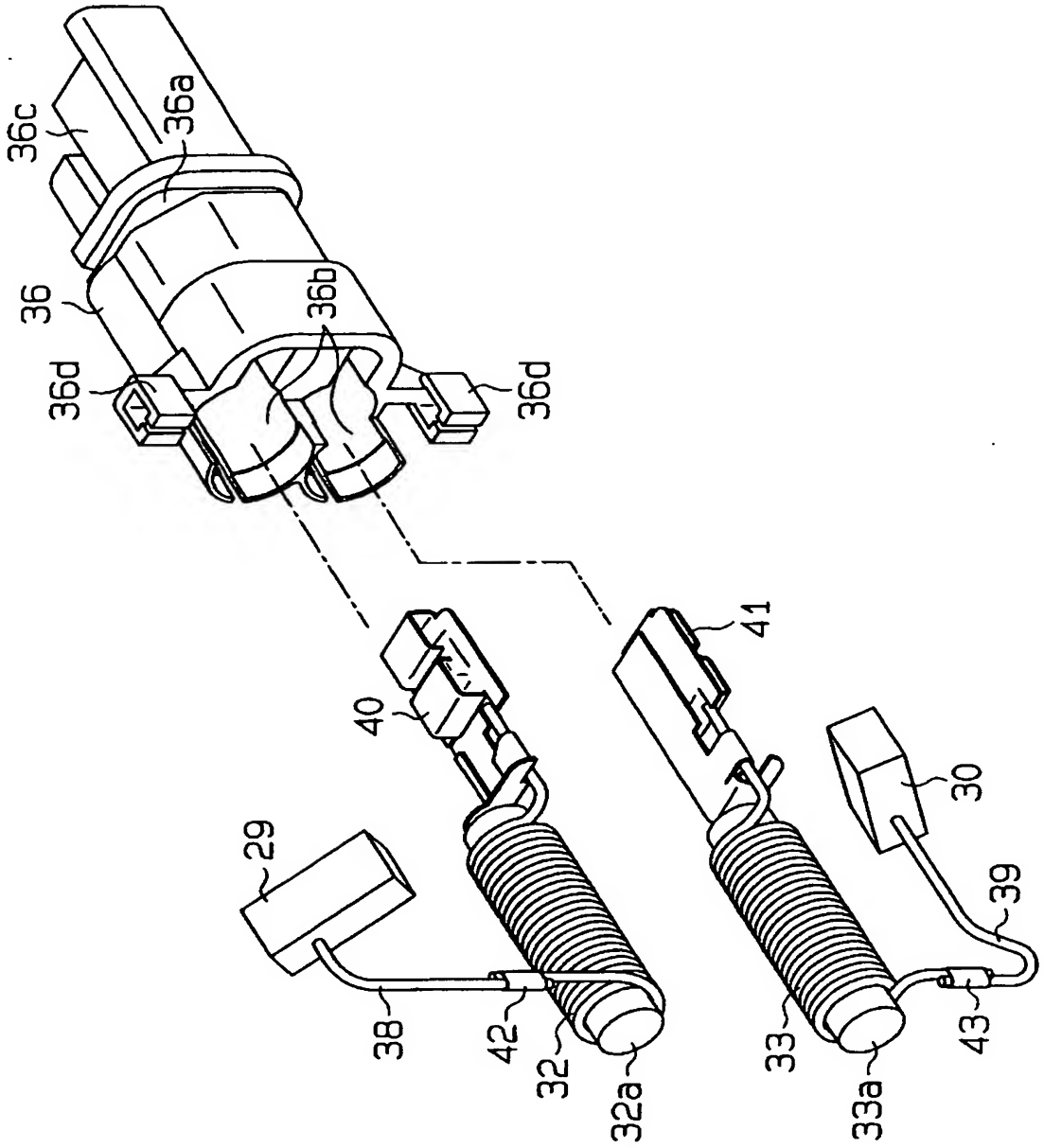
[Fig. 4]



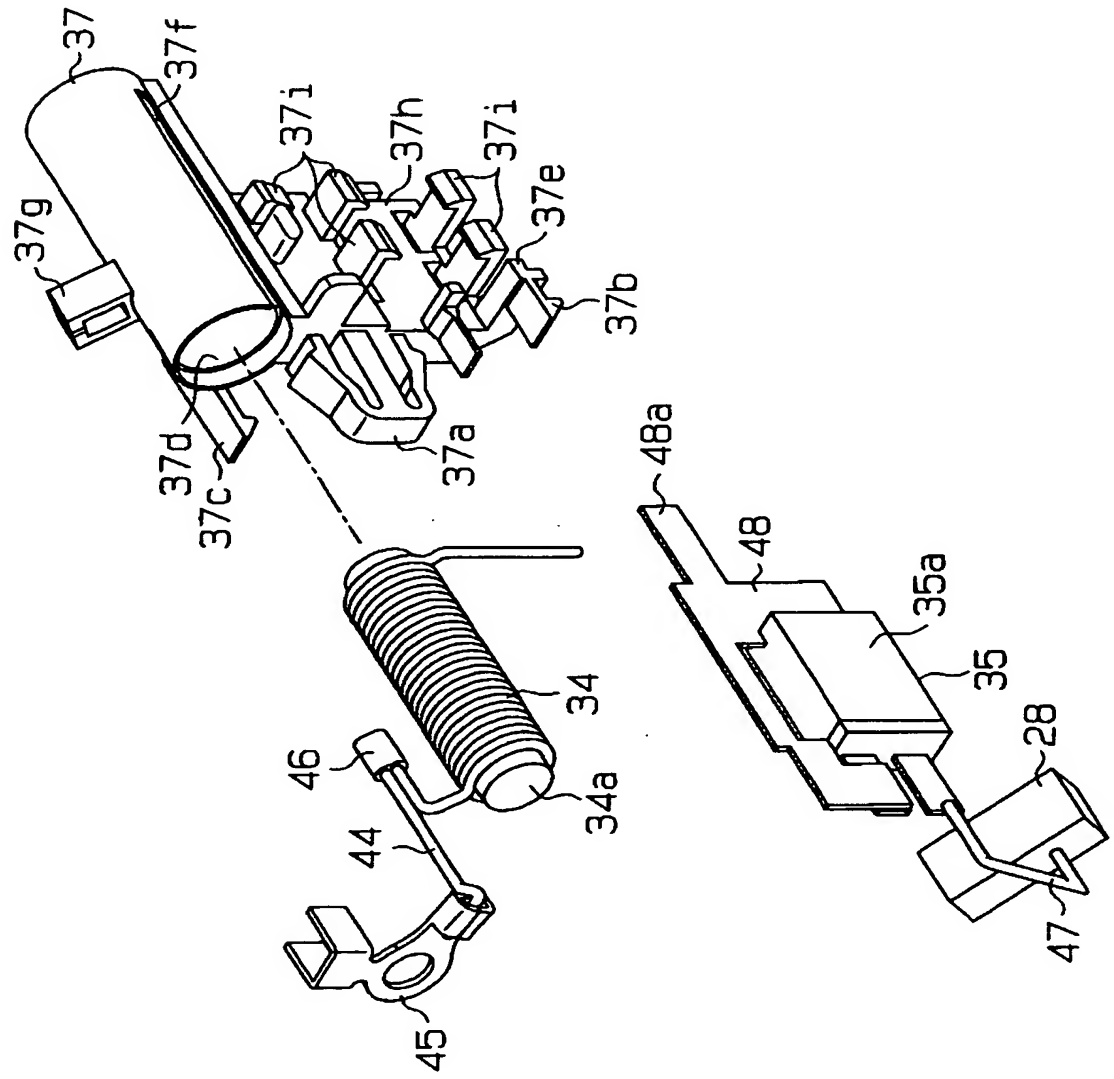
[Fig. 5]



[Fig. 6]



[Fig. 7]



[Fig.8]